

AMENDMENTS TO THE CLAIMS

Claim 1. (Canceled)

Claim 2. (Canceled)

Claim 3. (Canceled)

Claim 4. (Canceled)

Claim 5. (Currently amended) A method for monitoring performance of an advanced manufacturing process control system for at least one process output, the method comprising the steps of:

receiving process performance data for the at least one process output;

calculating, using the process performance data, at least one of a model health index, wherein the model health index indicates an estimate of an ability of a model to predict the behavior of the at least one process output as compared to an expected output, and a process health index, wherein the process health index indicates an estimated probability of violation by the at least one process output of predefined specification limits; and

indicating the results of the calculation based on the at least one of the model health index and the process health index.

Claim 6. (Original) The method of claim 5, wherein the step of calculating the model health index further comprises the steps of:

calculating a variance of a prediction error for a processing performance of the at least one process output; and

calculating a ratio of an estimate of a standard deviation of the prediction error to an expected estimate of the prediction error, wherein the standard deviation of the prediction error is derived from the variance of the prediction error.

Claim 7. (Original) The method of claim 6, wherein the variance of the prediction error indicates a bias between an actual output of the at least process output and the expected output.

Claim 8. (Original) The method of claim 6, wherein the variance of the prediction error is based on an exponentially weighted moving average.

Claim 9. (Original) The method of claim 6, wherein the estimate of the standard deviation of the prediction error is based on an exponentially weighted moving average.

Claim 10. (Original) The method of claim 5, wherein the step of calculating the process health index further comprises the steps of:

calculating a probability for violating specification limits of a processing performance of the at least one process output; and

calculating a ratio of the probability for violating the specification limits to a specified probability limit.

Claim 11. (Original) The method of claim 6, wherein the step of calculating the process health index further comprises the step of calculating a variance of a target deviation for the processing

performance of the at least one process output, wherein the variance of the target deviation indicates a bias between an actual output of the at least one process output and a target output.

Claim 12. (Original) The method of claim 11, wherein the variance of the target deviation is based on an exponentially weighted moving average.

Claim 13. (Original) The method of claim 5, further comprising the step of performing a notification function, wherein the notification function comprises sending an indication to a controller that the at least one of the model health index and the process health index is beyond an acceptable point.

Claim 14. (Original) The method of claim 13, wherein sending an indication to a controller further comprises sending at least one of a page, an electronic mail message, and a message to a wireless personal data assistant.

Claim 15. (Original) The method of claim 5, further comprising the step of performing a notification function, wherein the notification function comprises halting processing of the at least one process output if the at least one of the model health index and the process health index is beyond an acceptable point.

Claim 16. (Original) The method of claim 5, further comprising the step of performing a notification function, wherein the notification function further comprises displaying the at least one of the model health index and the process health index in a visual display to allow a controller to assess the process performance of the at least one process output.

Claim 17. (Original) The method of claim 5, further comprising the step of performing a notification function, wherein the notification function comprises storing the at least one of the model health index and the process health index, such that the at least one of the model health index and the process health index serves as an indication of the processing performance of the at least one process output.

Claim 18. (Original) The method of claim 17, wherein the notification function further comprises displaying the stored at least one of the model health index and the process health index in a visual display to allow a controller to assess the process performance of the at least one process output.

Claim 19. (Currently amended) A method for monitoring performance of an advanced manufacturing process control system for at least one process output, the method comprising the steps of:

calculating at least one of a variance of a prediction error for a processing performance of the at least one process output and a probability for violating specification limits of the processing performance of the at least one process output, wherein the at least one of the variance and the probability are based on an exponentially weighted moving average;

if the variance of the prediction error is calculated, calculating a model health index, wherein the model health index is a ratio of an exponentially weighted moving average-based estimate of a standard deviation of the prediction error to an expected estimate of the prediction error, and wherein the exponentially weighted moving average-based estimate of the standard deviation of the prediction error is derived from the variance of the prediction error;

if the probability for violating specification limits is calculated, calculating a process health index, wherein the process health index is a ratio of the probability for violating the specification limits to a specified probability limit; and

indicating the results of the calculation based on at least one of the model health index and the process health index.

Claim 20. (Original) The method of claim 19, further comprising the step of performing a notification function, wherein the notification function comprises sending an indication to a controller that the at least one of the model health index and the process health index is beyond an acceptable point.

Claim 21. (Original) The method of claim 20, wherein sending an indication to a controller further comprises sending at least one of a page, an electronic mail message, and a message to a wireless personal data assistant.

Claim 22. (Original) The method of claim 19, further comprising the step of performing a notification function, wherein the notification function comprises halting processing of the at least one process output if the at least one of the model health index and the process health index is beyond an acceptable point.

Claim 23. (Original) The method of claim 19, further comprising the step of performing a notification function, wherein the notification function further comprises displaying the at least one of the model health index and the process health index in a visual display to allow a controller to assess the process performance of the at least one process output.

Claim 24. (Original) The method of claim 19, further comprising the step of performing a notification function, wherein the notification function comprises storing the at least one of the model health index and the process health index, such that the at least one of the model health index and the process health index serves as an indication of the processing performance of the at least one process output.

Claim 25. (Original) The method of claim 24, wherein the notification function further comprises displaying the at least one of the model health index and the process health index in a visual display to allow a controller to assess the process performance of the at least one process output.

Claim 26. (Currently amended) A method for monitoring performance of an advanced manufacturing process control system for at least one process output, the method comprising the steps of:

receiving process performance data for the at least one process output;

calculating at least one of a current model health index, wherein the current model health index indicates an estimate of an ability of a model to predict the behavior of a current one of the at least one process output as compared to an expected output, and a current process health index, wherein the current process health index indicates an estimated probability of violation by a current one of the at least one process output of predefined specification limits;

if the current model health index is calculated, calculating a subsequent model health index, wherein the subsequent model health index indicates an estimate of an ability of a model to predict

the behavior of a subsequent one of the at least one process output as compared to an expected output;

if the subsequent model health index is calculated, storing the current model health index and the subsequent model health index, such that comparing the current model health index and the subsequent model health index give an indication of a processing performance of the at least one process output;

if the current process health index is calculated, calculating a subsequent process health index, wherein the subsequent process health index indicates an estimated probability of violation by a subsequent one of the at least one process output of predefined specification limits; and

if the subsequent process health index is calculated, storing the current process health index and the subsequent process health index, such that comparing the current process health index and the current process health index gives an indication of the processing performance of the at least one process output.

Claim 27. (Currently amended) A method for monitoring performance of an advanced manufacturing process control system for at least one process output, the method comprising the steps of:

calculating at least one of a current variance of a prediction error for a processing performance of the at least one process output and a current probability for violating specification limits of the processing performance of the at least one process output, wherein the at least one of

the current variance and the current probability are based on an exponentially weighted moving average;

if the current variance of the prediction error is calculated, calculating a current model health index, wherein the current model health index is a ratio of a current exponentially weighted moving average-based estimate of a standard deviation of the prediction error to an expected estimate of the prediction error, and wherein the current exponentially weighted moving average-based estimate of the standard deviation of the prediction error is derived from the current variance of the prediction error;

if the current model health index is calculated, calculating a subsequent model health index, wherein the subsequent model health index is calculated in a substantially similar manner to the current model health index;

if the subsequent model health index is calculated, storing the current model health index and the subsequent model health index, such that comparing the current model health index and the subsequent model health index gives an indication of the processing performance of the at least one process output;

if the current probability for violating specification limits is calculated, calculating a current process health index, wherein the current process health index is a ratio of the probability for violating the specification limits to a probability limit;

if the current process health index is calculated, calculating a subsequent process health index, wherein the subsequent process health index is calculated in a substantially similar manner to the current process health index; and

if the subsequent process health index is calculated, storing the current process health index and the subsequent process health index, such that comparing the current process health index and the subsequent process health index gives an indication of the processing performance of the at least one process output.

Claim 28. (Currently amended) A method for monitoring performance of an advanced manufacturing process control system for a plurality of process outputs, the method comprising the steps of:

calculating at least one of a first model health index of a process performance of a first one of the plurality of process outputs and a first process health index of the process performance of the first one of the plurality of process outputs;

calculating at least one of a second model health index of the process performance of a second one of the plurality of process outputs and a second process health index of the process performance of the second one of the plurality of process outputs;

if the first model health index and the second model health index are calculated, calculating an aggregate model health index of the process performance of the plurality of process outputs; and

if the first process health index and the second process health index are calculated, calculating an aggregate process health index of the process performance of the plurality of process outputs.

Claim 29. (Original) The method of claim 28, wherein the aggregate model health index is calculated using a geometric mean of the first model health index and the second model health index and the aggregate process health index is calculated using a geometric mean of the first process health index and the second process health index.

Claim 30. (Original) The method of claim 28, further comprising:

calculating at least one of an n th, where n is a number greater than three, model health index of a process performance of a n th one of the plurality of process outputs and a n th process health index of the process performance of the n th one of the plurality of process outputs;

if the first model health index, the second model health index are calculated, and the n th model health index are calculated, calculating the aggregate model health index of the process performance of the plurality of process outputs; and

if the first process health index, the second process health index, and the n th process health index are calculated, calculating the aggregate process health index of the process performance of the plurality of process outputs.

Claim 31. (Original) The method of claim 30, wherein the aggregate model health index is calculated using a geometric mean of the first model health index, the second model health index, and the n th model health index and the aggregate process health index is calculated using a

geometric mean of the first process health index, the second process health index, and the nth process health index.

Claim 32. (Canceled)

Claim 33. (Currently amended) A system for monitoring performance of an advanced manufacturing process control system for at least one process output, comprising:

a first memory that stores at least one of a predicted value for process performance of the at least one process output and a target value for process performance of the at least one process output;

a second memory that stores process performance data of the at least one process output;

a third memory that stores at least one of a model health algorithm and a process health algorithm, wherein the model health algorithm is used to calculate a model health index of the process performance and the process health algorithm is used to calculate a process health index of the process performance; and

a processor, operably connected to the first memory, the second memory and the third memory, that calculates at least one of the model health index using the model health algorithm and the process health index using the process health algorithm, wherein the model health index is calculated based on a comparison of the predicted value and the process performance data of the at least one process output, and wherein the process health index is calculated based on a comparison of the target value and the process performance data of the at least one process output.

Claim 34. (Original) The system of claim 33, further comprising a user input interface that receives the at least one of the predicted value for process performance of the at least one process output and the target value for the process performance of the at least one process output and stores the at least one of the predicted value and the target value in the first memory.

Claim 35. (Original) The system of claim 33, wherein the processor is capable of halting processing of the at least one process output if the at least one of the model health index and the process health index is beyond an acceptable point.

Claim 36. (Original) The system of claim 33, further comprising a communications interface, wherein the processor is capable of sending a notification message to a controller if the at least one of the model health index and the process health index is beyond an acceptable point.

Claim 37. (Original) The system of claim 36, wherein the communications interface is at least one of a radio transmitter and a communications port.

Claim 38. (Original) The system of claim 36, wherein the notification message comprises at least one of a page, an electronic mail message, and a message to a wireless personal data assistant.

Claim 39. (Original) The system of claim 33, further comprising a fourth memory that stores the at least one of the model health index and the process health index, such that the at least one of the model health index and the process health index serves as an indication of the processing performance of the at least one process output.

Claim 40. (Original) The system of claim 33, further comprising a display that displays the at least one of the model health index and the process health index as a visual display, such that the at least one of the model health index and the process health index serves as an indication of the processing performance of the at least one process output.

Claim 41. (Currently amended) A system for monitoring performance of an advanced manufacturing process control system for at least one process output, comprising:

first storage means for storing at least one of a predicted value for process performance of the at least one process output and a target value for process performance of the at least one process output;

second storage means for storing process performance data of the at least one process output;

third storage means for storing at least one of a model health algorithm and a process health algorithm, wherein the model health algorithm is used to calculate a model health index of the process performance and the process health algorithm is used to calculate a process health index of the process performance; and

processing means, operably connected to the first storage means, the second storage means and the third storage means, that calculates at least one of the model health index using the model health algorithm and the process health index using the process health algorithm, wherein the model health index is calculated based on a comparison of the predicted value and the process performance

data of the at least one process output, and wherein the process health index is calculated based on a comparison of the target value and the process performance data of the at least one process output.

Claim 42. (Original) The system of claim 41, further comprising user input means for receiving the at least one of the predicted value for process performance of the at least one process output and the target value for the process performance of the at least one process output and storing the at least one of the predicted value and the target value in the first storage means.

Claim 43. (Original) The system of claim 41, further comprising control interface means between the processor and the at least one process output for enabling the processing means to halt processing of the at least one process output if the at least one of the model health index and the process health index is beyond an acceptable point.

Claim 44. (Original) The system of claim 41, further comprising communications interface means for enabling the processing means to send a notification message to a controller if the at least one of the model health index and the process health index is beyond an acceptable point.

Claim 45. (Original) The system of claim 44, wherein the notification message comprises at least one of a page, an electronic mail message, and a message to a wireless personal data assistant.

Claim 46. (Original) The system of claim 41, further comprising fourth storage means for storing the at least one of the model health index and the process health index, such that the at least one of the model health index and the process health index serves as an indication of the processing performance of the at least one process output.

Claim 47. (Original) The system of claim 41, further comprising display means for displaying the at least one of the model health index and the process health index as a visual display, such that the at least one of the model health index and the process health index serves as an indication of the processing performance of the at least one process output.

Claim 48. (Canceled)

Claim 49. (Canceled)

Claim 50. (Currently amended) A system for monitoring performance of an advanced manufacturing process control system for at least one process output, comprising:

means for receiving process performance data for the at least one process output;

means for calculating at least one of a model health index, wherein the model health index indicates an estimate of an ability of a model to predict the behavior of the at least one process output as compared to an expected output, and a process health index, wherein the process health index indicates an estimated probability of violation by the at least one process output of predefined specification limits; and

means for indicating the results of the calculation based on the at least one of the model health index and the process health index.

Claim 51. (Canceled)

Claim 52. (Canceled)

Claim 53. (Canceled)

Claim 54. (Currently amended) A system for monitoring performance of an advanced manufacturing process control system for at least one process output, the system comprising:

at least one tool, which measures the at least one process output; and

a controller, coupled to the at least one tool, which provides for central control of the at least one tool, the controller implementing instructions for controlling the at least one tool, the instructions comprising:

receiving process performance data for the at least one process output;

calculating at least one of a model health index, wherein the model health index indicates an estimate of an ability of a model to predict the behavior of the at least one process output as compared to an expected output, and a process health index, wherein the process health index indicates an estimated probability of violation by the at least one process output of predefined specification limits; and

indicating the results of the calculation based on the at least one of the model health index and the process health index.

Claim 55. (Currently amended) A system for monitoring performance of an advanced manufacturing process control system for at least one process output, the system comprising:

at least one tool, which measures the at least one process output; and

a controller, coupled to the at least one tool, which provides for central control of the at least one tool, the controller implementing instructions for controlling the at least one tool, the instructions comprising:

calculating at least one of a variance of a prediction error for a processing performance of the at least one process output and a probability for violating specification limits of the processing performance of the at least one process output, wherein the at least one of the variance and the probability are based on an exponentially weighted moving average;

if the variance of the prediction error is calculated, calculating a model health index, wherein the model health index is a ratio of an exponentially weighted moving average-based estimate of a standard deviation of the prediction error to an expected estimate of the prediction error, and wherein the exponentially weighted moving average-based estimate of the standard deviation of the prediction error is derived from the variance of the prediction error;

if the probability for violating specification limits is calculated, calculating a process health index, wherein the process health index is a ratio of the probability for violating the specification limits to a specified probability limit; and

performing a notification function based on at least one of the model health index and the process health index.

Claim 56. (Currently amended) A system for monitoring performance of an advanced manufacturing process control system for at least one process output, the system comprising:

at least one tool, which measures the at least one process output; and

a controller, coupled to the at least one tool, which provides for central control of the at least one tool, the controller implementing instructions for controlling the at least one tool, the instructions comprising:

receiving process performance data for the at least one process output;

calculating at least one of a current model health index, wherein the current model health index indicates an estimate of an ability of a model to predict the behavior of a current one of the at least one process output as compared to an expected output, and a current process health index, wherein the current process health index indicates an estimated probability of violation by a current one of the at least one process output of predefined specification limits;

if the current model health index is calculated, calculating a subsequent model health index, wherein the subsequent model health index indicates an estimate of an ability of a model to predict the behavior of a subsequent one of the at least one process output as compared to an expected output;

if the subsequent model health index is calculated, storing the current model health index and the subsequent model health index, such that comparing the current model health index and the subsequent model health index give an indication of a processing performance of the at least one process output;

if the current process health index is calculated, calculating a subsequent process health index, wherein the subsequent process health index indicates an estimated probability of

violation by a subsequent one of the at least one process output of predefined specification limits;
and

if the subsequent process health index is calculated, storing the current process health index and the subsequent process health index, such that comparing the current process health index and the subsequent process health index gives an indication of the processing performance of the at least one process output.

Claim 57. (Currently amended) A system for monitoring performance of an advanced manufacturing process control system for at least one process output, the system comprising:

at least one tool, which measures the at least one process output; and

a controller, coupled to the at least one tool, which provides for central control of the at least one tool, the controller implementing instructions for controlling the at least one tool, the instructions comprising:

calculating at least one of a current variance of a prediction error for a processing performance of the at least one process output and a current probability for violating specification limits of the processing performance the at least one process output, wherein the at least one of the current variance and the current probability are based on an exponentially weighted moving average;

if the current variance of the prediction error is calculated, calculating a current model health index, wherein the current model health index is a ratio of a current exponentially weighted moving average-based estimate of a standard deviation of the prediction error to an

expected estimate of the prediction error, and wherein the current exponentially weighted moving average-based estimate of the standard deviation of the prediction error is derived from the current variance of the prediction error;

if the current model health index is calculated, calculating a subsequent model health index, wherein the subsequent model health index is calculated in a substantially similar manner to the current model health index;

if the subsequent model health index is calculated, storing the current model health index and the subsequent model health index, such that comparing the current model health index and the subsequent model health index gives an indication of the processing performance of the at least one process output;

if the current probability for violating specification limits is calculated, calculating a current process health index, wherein the current process health index is a ratio of the probability for violating the specification limits to a probability limit;

if the current process health index is calculated, calculating a subsequent process health index, wherein the subsequent process health index is calculated in a substantially similar manner to the current process health index; and

if the subsequent process health index is calculated, storing the current process health index and the subsequent process health index, such that comparing the current process health index and the subsequent process health index gives an indication of the processing performance of the at least one process output.

Claim 58. (Currently amended) A system for monitoring performance of an advanced manufacturing process control system for at least one process output, the system comprising:

at least one tool, which measures the at least one process output; and

a controller, coupled to the at least one tool, which provides for central control of the at least one tool, the controller implementing instructions for controlling the at least one tool, the instructions comprising:

calculating at least one of a first model health index of a process performance of a first one of the plurality of process outputs and a first process health index of the process performance of the first one of the plurality of process outputs;

calculating at least one of a second model health index of the process performance of a second one of the plurality of process outputs and a second process health index of the process performance of the second one of the plurality of process outputs;

if the first model health index and the second model health index are calculated, calculating an aggregate model health index of the process performance of the plurality of process outputs; and

if the first process health index and the second process health index are calculated, calculating an aggregate process health index of the process performance of the plurality of process outputs.

Claim 59. (Canceled)

Claim 60. (Currently amended) A computer-readable medium of instructions for monitoring performance of an advanced manufacturing process control system for at least one process output, the instructions comprising:

receiving process performance data for the at least one process output;

calculating at least one of a model health index, wherein the model health index indicates an estimate of an ability of a model to predict the behavior of the at least one process output as compared to an expected output, and a process health index, wherein the process health index indicates an estimated probability of violation by the at least one process output of predefined specification limits; and

indicating the results of the calculation based on the at least one of the model health index and the process health index.

Claim 61. (Currently amended) A computer-readable medium of instructions for monitoring performance of an advanced manufacturing process control system for at least one process output, the instructions comprising:

calculating at least one of a variance of a prediction error for a processing performance of the at least one process output and a probability for violating specification limits of the processing performance of the at least one process output, wherein the at least one of the variance and the probability are based on an exponentially weighted moving average;

if the variance of the prediction error is calculated, calculating a model health index, wherein the model health index is a ratio of an exponentially weighted moving average-based estimate of a

standard deviation of the prediction error to an expected estimate of the prediction error, and wherein the exponentially weighted moving average-based estimate of the standard deviation of the prediction error is derived from the variance of the prediction error;

if the probability for violating specification limits is calculated, calculating a process health index, wherein the process health index is a ratio of the probability for violating the specification limits to a specified probability limit; and

indicating the results of the calculation based on at least one of the model health index and the process health index.

Claim 62. (Canceled)

Claim 63. (Currently amended) A computer-readable medium of instructions for monitoring performance of an advanced manufacturing process control system for at least one process output, the instructions comprising:

receiving process performance data for the at least one process output;

calculating at least one of a current model health index, wherein the current model health index indicates an estimate of an ability of a model to predict the behavior of a current one of the at least one process output as compared to an expected output, and a current process health index, wherein the current process health index indicates an estimated probability of violation by a current one of the at least one process output of predefined specification limits;

if the current model health index is calculated, calculating a subsequent model health index, wherein the subsequent model health index indicates an estimate of an ability of a model to predict

the behavior of a subsequent one of the at least one process output as compared to an expected output;

if the subsequent model health index is calculated, storing the current model health index and the subsequent model health index, such that comparing the current model health index and the subsequent model health index give an indication of a processing performance of the at least one process output;

if the current process health index is calculated, calculating a subsequent process health index, wherein the subsequent process health index indicates an estimated probability of violation by a subsequent one of the at least one process output of predefined specification limits; and

if the subsequent process health index is calculated, storing the current process health index and the subsequent process health index, such that comparing the current process health index and the current process health index gives an indication of the processing performance of the at least one process output.

Claim 64. (Currently amended) A computer-readable medium of instructions for monitoring performance of an advanced manufacturing process control system for at least one process output, the instructions comprising:

calculating at least one of a current variance of a prediction error for a processing performance of the at least one process output and a current probability for violating specification limits of the processing performance the at least one process output, wherein the at least one of the

current variance and the current probability are based on an exponentially weighted moving average;

if the current variance of the prediction error is calculated, calculating a current model health index, wherein the current model health index is a ratio of a current exponentially weighted moving average-based estimate of a standard deviation of the prediction error to an expected estimate of the prediction error, and wherein the current exponentially weighted moving average-based estimate of the standard deviation of the prediction error is derived from the current variance of the prediction error;

if the current model health index is calculated, calculating a subsequent model health index, wherein the subsequent model health index is calculated in a substantially similar manner to the current model health index;

if the subsequent model health index is calculated, storing the current model health index and the subsequent model health index, such that comparing the current model health index and the subsequent model health index gives an indication of the processing performance of the at least one process output;

if the current probability for violating specification limits is calculated, calculating a current process health index, wherein the current process health index is a ratio of the probability for violating the specification limits to a probability limit;

if the current process health index is calculated, calculating a subsequent process health index, wherein the subsequent process health index is calculated in a substantially similar manner to the current process health index; and

if the subsequent process health index is calculated, storing the current process health index and the subsequent process health index, such that comparing the current process health index and the subsequent process health index gives an indication of the processing performance of the at least one process output.

Claim 65. (Currently amended) A computer-readable medium of instructions for monitoring performance of an advanced manufacturing process control system for at least one process output, the instructions comprising:

calculating at least one of a first model health index of a process performance of a first one of the plurality of process outputs and a first process health index of the process performance of the first one of the plurality of process outputs;

calculating at least one of a second model health index of the process performance of a second one of the plurality of process outputs and a second process health index of the process performance of the second one of the plurality of process outputs;

if the first model health index and the second model health index are calculated, calculating an aggregate model health index of the process performance of the plurality of process outputs; and

if the first process health index and the second process health index are calculated,
calculating an aggregate process health index of the process performance of the plurality of process
outputs.

Claim 66. (Canceled)